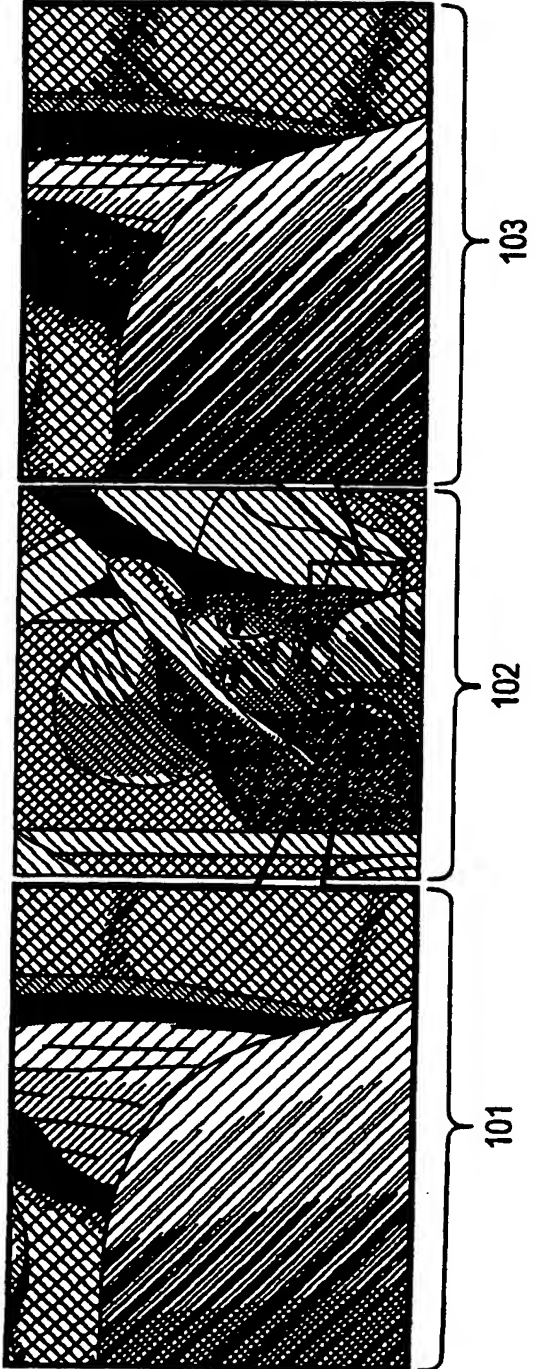


FIG. 1



201

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Most Significant Device (MSD)								Least Significant Device (LSD)															

202

R7	R6	R5	R4	R3	R2	R1	R0	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Most Significant Device (MSD)								Least Significant Device (LSD)										

Fig. 2

300

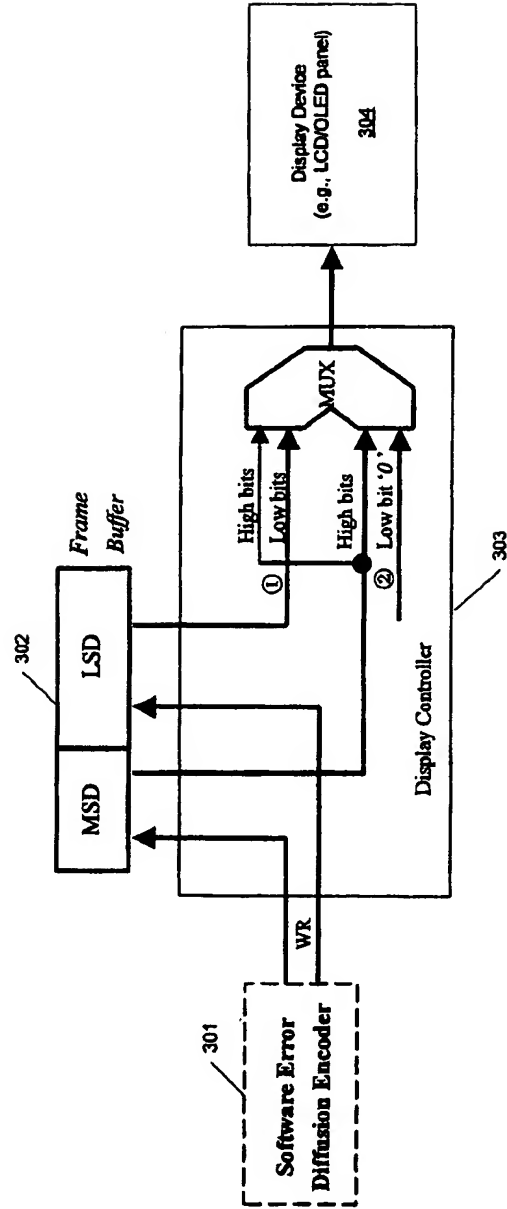


Fig. 3

400

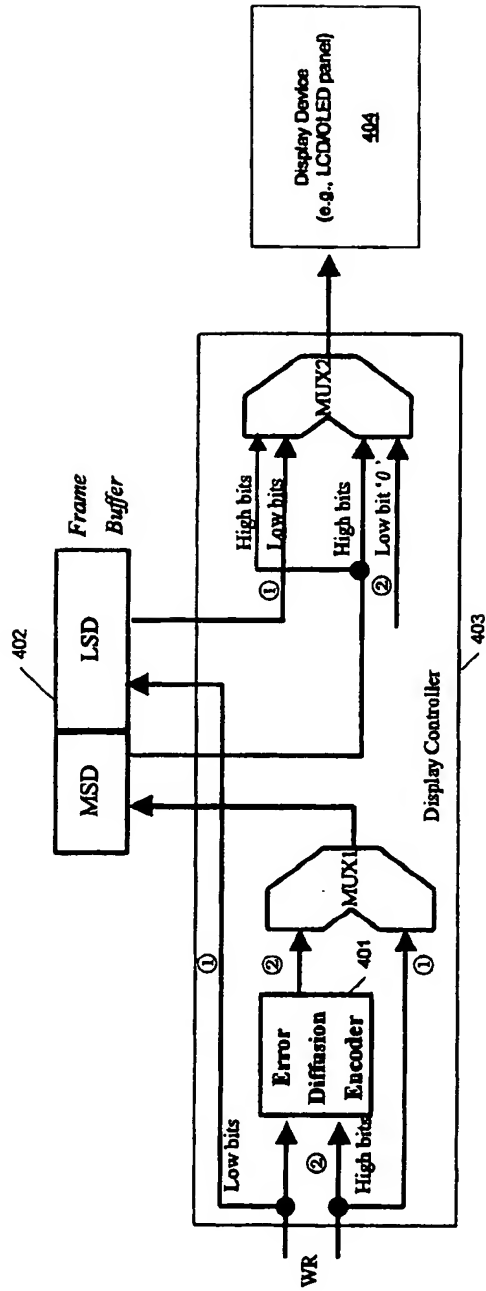


Fig. 4

500

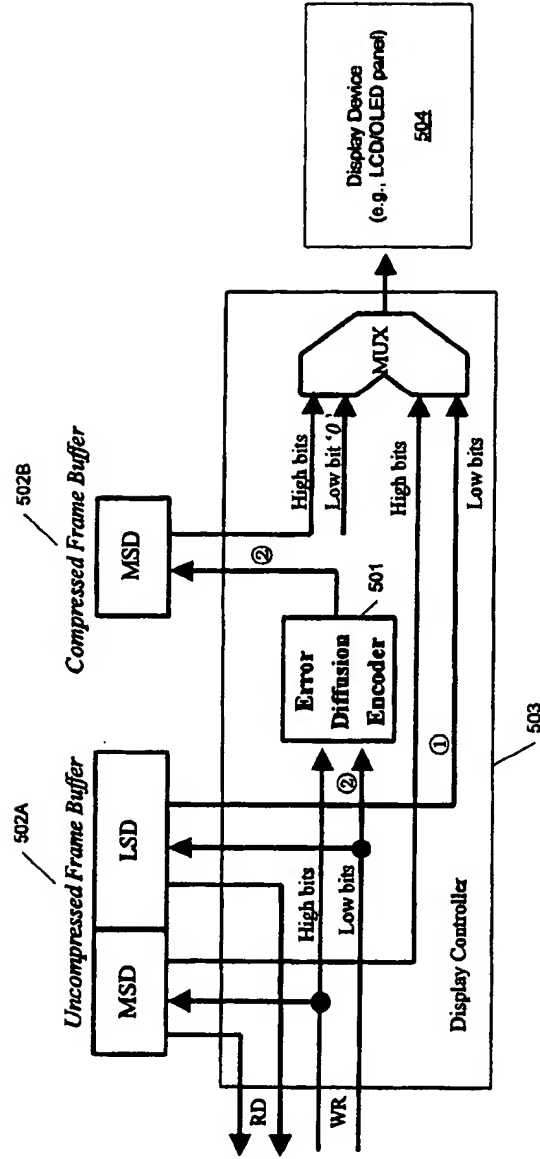


Fig. 5

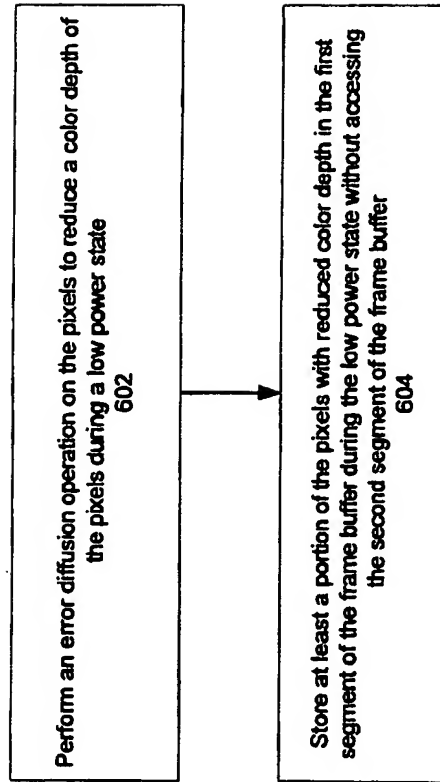


Fig. 6A

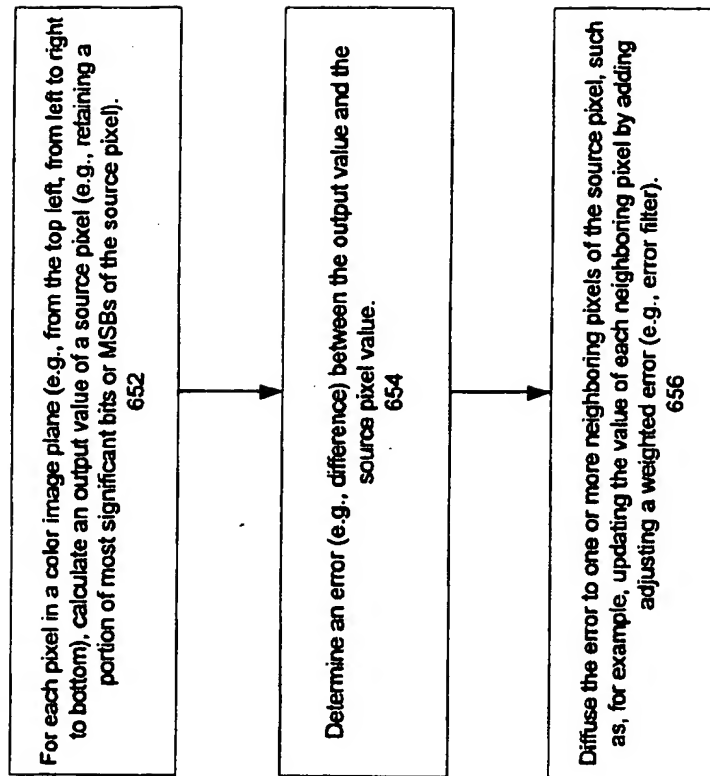


Fig. 6B

Notation	
<i>buffer</i> []	Memory buffer sized of one image row to store the error diffused to the bottom pixels
<i>register</i>	Register to store the error diffused to the right pixel
<i>FrameBuffer</i> []	Frame buffer to store the result image pixel, the addressing between scan lines is omitted
<i>SrcImage</i> []	Original image data, the addressing between scan lines is omitted
<i>temp_sum</i> ,	Temporary buffer, can be implemented by register
<i>temp_error</i>	
Algorithm	
1. Set all the cells in <i>buffer</i> [] to 0	
2. For each row in the image	
3. Set <i>register</i> to 0	
4. For each pixel position <i>x</i> in one row	
5. <i>temp_sum</i> = <i>SrcImage</i> [<i>x</i>] + <i>register</i> + <i>buffer</i> [<i>x</i>]	(update the current image pixel value)
6. if (overflow in sum operation) <i>temp_sum</i> = 255	
7. <i>FrameBuffer</i> [<i>x</i>] = <i>temp_sum</i> & 0xe0	(quantizing to get output pixel value)
8. <i>temp_error</i> = <i>temp_sum</i> & 0x1f	(calculate error)
9. <i>register</i> = <i>temp_error</i> >> 1	(diffuse error to the right pixel)
10. <i>buffer</i> [<i>x</i>] = <i>temp_error</i> >> 1	(diffuse error to the bottom pixel)
11. End of For	
12. End of For	

Fig. 7

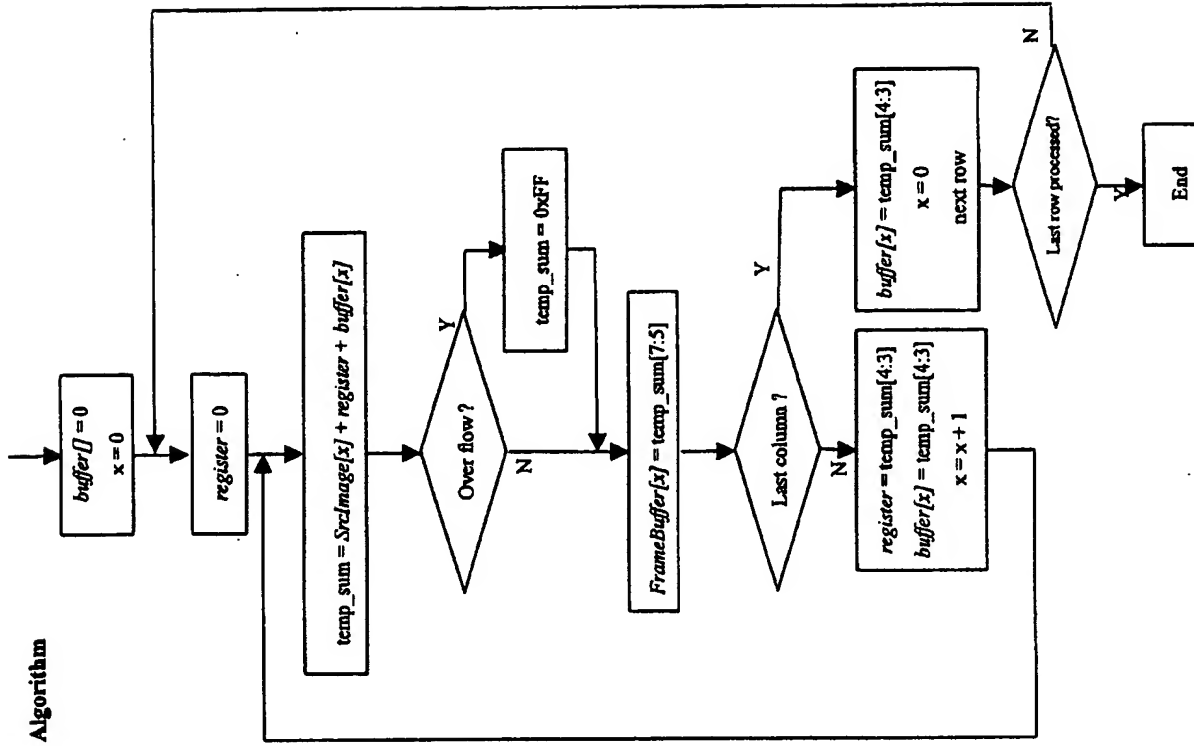


Fig. 8

Notation

- buffer[]* buffer store one line of diffused error for the row below, each cell of the buffer has 2 bits
- register* register store diffused error for pixel to the right, 2 bits
- FrameBuffer[]* MSB part of the display buffer memory, each cell has 3 bits
- SrcImage[]* original image pixel data fed via the display interface to the host system
- $X[a.b]$ b, b+1, ..., a-1, a bit of data X

```

module ErrorDiffuse(R_i, clk, R_o);

    input    [7:0]  R_i;
    input    clk;
    output   [2:0]  R_o;
    reg      [1:0]  error_n[1], error_n[1];
    wire     [7:0]  temp_R;
    integer    raw_cnt, line_cnt;

    if((line_cnt==1)&&(raw_cnt==1))
        assign temp_R=R_i;
    else if((line_cnt==1)&&(raw_cnt!=1))
        assigna temp_R=R_i+{error_n[1],2'b00}<R_i?8'hFF:R_i+{error_n[1],2'b00};
    else if((line_cnt!=1)&&(raw_cnt==1))
        assigna temp_R=R_i+{error_n[raw_cnt],2'b00}<R_i?8'hFF:R_i+{error_n[raw_cnt],2'b00};
    else
        assigna temp_R=R_i+{error_n[raw_cnt],2'b00}+{error_n[1],2'b00}<R_i?8'hFF:R_i+{error_n[1],2'b00};

    always @(posedge clk)
        begin
            error_n[1] = temp_R[4:3];
            error_n[raw_cnt] = error_n[1];
        end
    assigna R_o = temp_R[7:5];

endmodule

```

Fig. 9

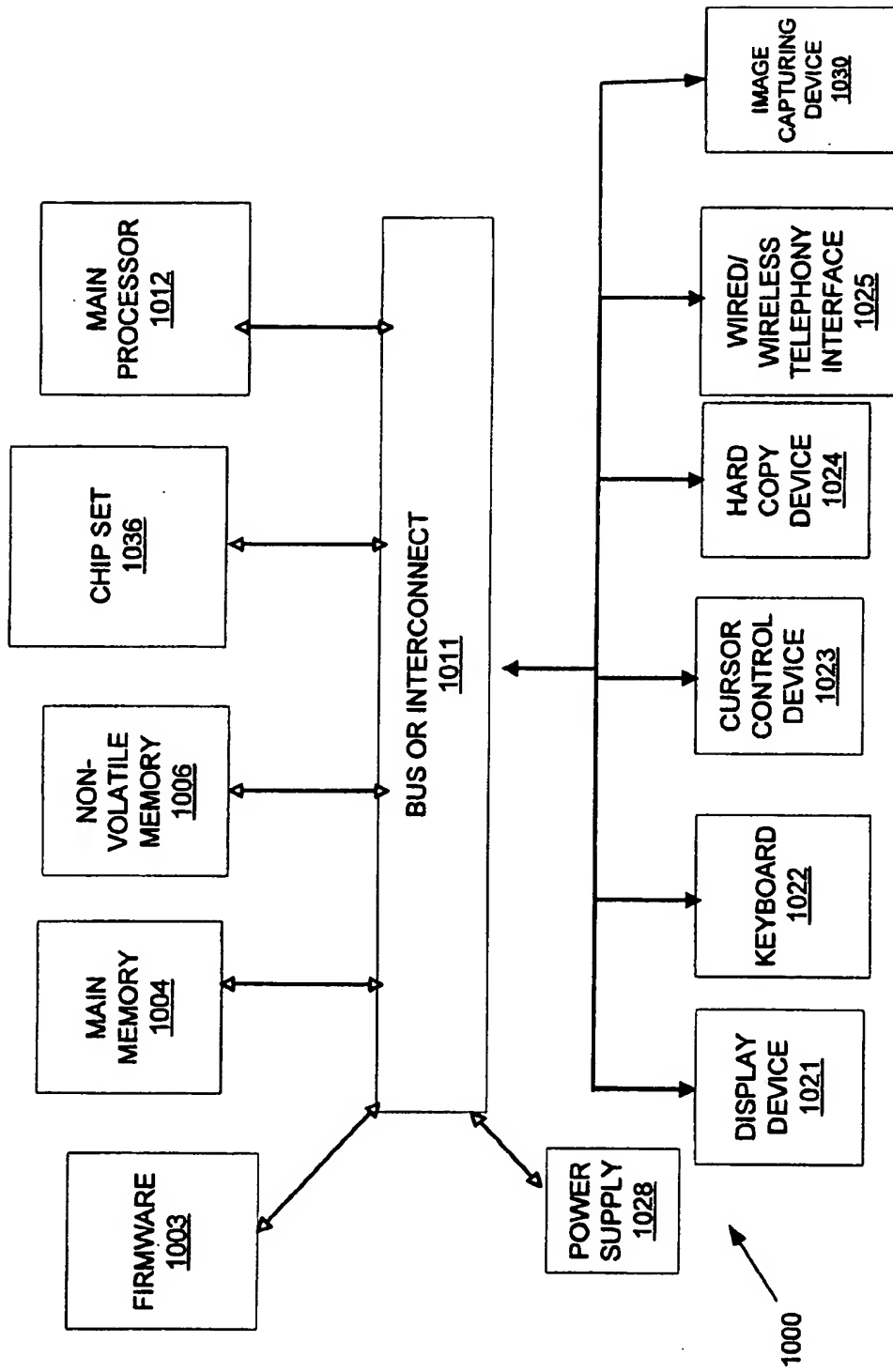


FIG. 10

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